



Chapter 10.1 and 10.2: Boolean Algebra

Based on Slides from
Discrete Mathematical Structures:
Theory and Applications

Learning Objectives

- ❑ Learn about Boolean expressions
- ❑ Become aware of the basic properties of Boolean algebra

Two-Element Boolean Algebra

Let $B = \{0, 1\}$.

We can define the three operations $+$, \cdot , and $'$ on B as follows.

$+$	1	0	\cdot	1	0	$'$
1	1	1	1	1	0	0
0	1	0	0	0	0	1

In other words,

$$\begin{aligned} 1 + 1 &= 1, & 1 + 0 &= 1, & 0 + 1 &= 1, & 0 + 0 &= 0, \\ 1 \cdot 1 &= 1, & 1 \cdot 0 &= 0, & 0 \cdot 1 &= 0, & 0 \cdot 0 &= 0, \\ 1' &= 0, & 0' &= 1. \end{aligned}$$

The operations $+$, \cdot , and $'$ on $B = \{0, 1\}$ are called the **Boolean sum**, **Boolean product**, and **Boolean complementation**, respectively.